Instruction Manual

ANDERSON-NEGELE

Instrument Model Number _____

Instrument Serial Number _____
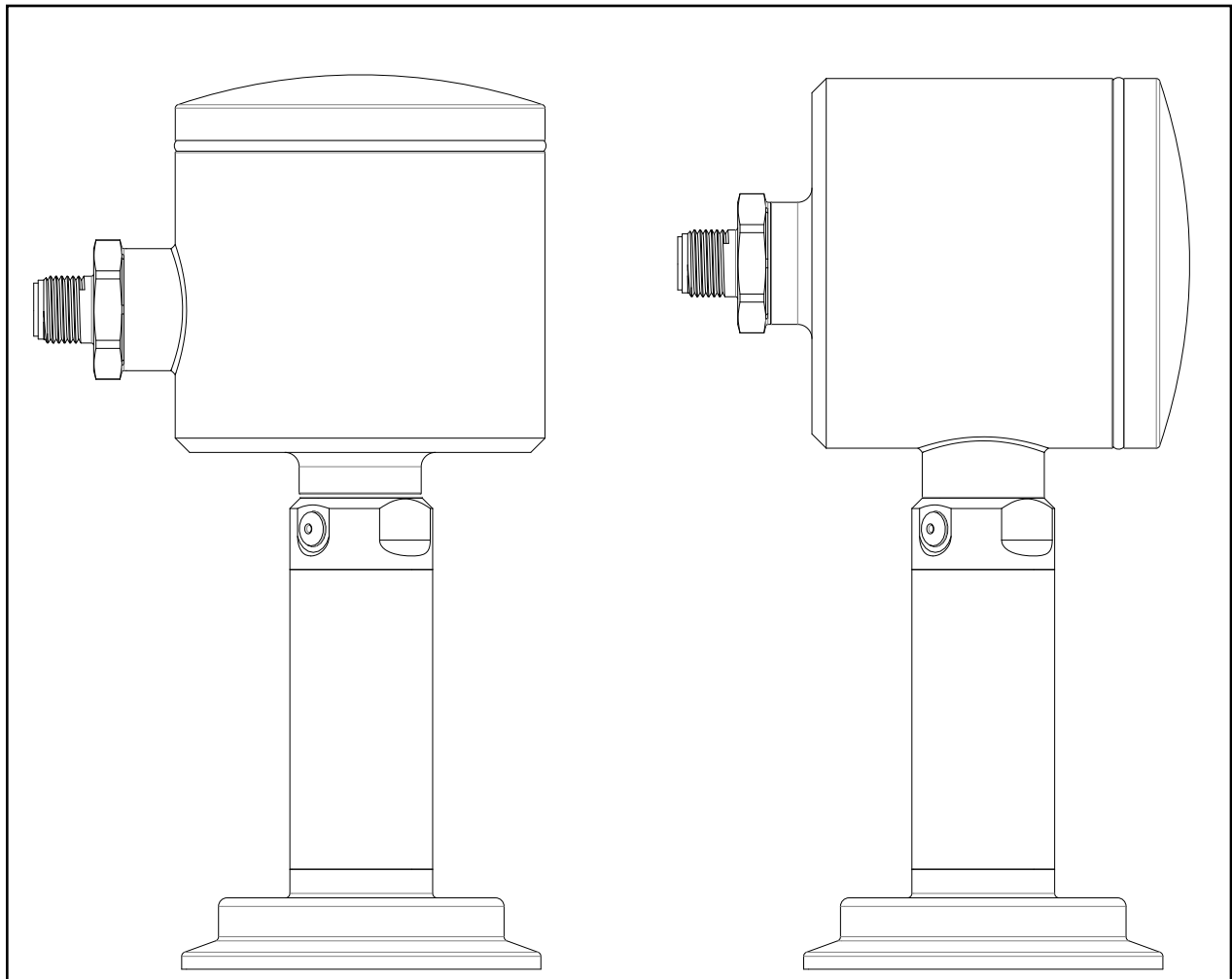
"MPP" Modular Pressure Transmitter

Table of Contents

Section 1 - Introduction

1.1 Specifications

PERFORMANCE MECHANICAL & ELECTRICAL:

Calibrated Accuracy:	± 0.07% of calibrated range up to 5:1 turndown (± 0.10% if over 5:1 turndown)
Repeatability:	0.05% as calibrated
Long Term Stability:	0.2% URL for 2 years
Process Temperature Effect:	± 0.1 psi/10°F (5.5°C) typical
Ambient Temperature Effect:	± 0.1 psi/10°F (5.5°C) typical
Over-Range Capability:	30/100/500 psi stem: 　1.5x URL no effect on accuracy 　2x URL to failure 1000 psi stem: 　1.1x URL no effect on accuracy 　1.25x URL to failure
Response Time:	<100 Milliseconds
Sampling Rate:	<50 Milliseconds
Damping:	Menu adjustable
Range Turndown Capability:	10 to 1 turn down from URL
Ranges, URL (PSI):	30,100,500,1K compound 30,100,500 absolute
Ranges, URL (BAR):	2,7,35,70 compound 2,7,35 absolute

ENVIRONMENTAL:

Process Temperature Limits:	0 to 350°F (-18 to 177°C) with ambient temperatures to 140°F (60°C) and 0 to 330°F (0 to 71°C) with ambient temperatures to 160°F (71°C)
Ambient Temperature Limits:	32 to 160°F (0 to 71°C)
Enclosure Protection:	NEMA 4X & IP67 IP69K(when equipped with QDR)

CONSTRUCTION / FINISH:

Product Contact:	316L Electropolished and finished to a Max. Ra <8 microinches. Optional: Hastelloy® diaphragm
Non-Product Contact Metal:	316L & 304 finished to a Max. Ra <32 microinches and polished to a high gloss
Non-Product Contact Plastic:	polycarbonate threaded cap. Delrin atmospheric vent
Wiring Connection:	M16 x 1.5 threaded housing electrical entry Equipped with: 　Standard - replaceable M12 5 pin Eurofast QDR 　Optional - M16 Cord Grip, M16 x 1.5" NPTF adaptor, Minifast 7/8" 4pin

OPERATIONAL:

Internal Fill:	ETR (Extended Temperature Range) FDA approved mineral oil, Optional Neobee 20®
Output:	2 wire user selectable 4-20 mA DC or 20-4 mA HART 7.0 digital communications protocol, or Foundation Fieldbus
Internal Display:	4 digit LED nominally displays loop current. Process variable selectable - PSI or BAR.
Display Interface:	Modular, Field replaceable. 5-digit LED, 170 field of view, Analog bar graph, configurable visible alarm alerts, Selectable display units - Millibar, Torr & Kg/cm2, PSI, BAR, kPA, In H2O, In Hg, mm H2O, mA
Loop Resistance:	0-300 ohms at 24 VDC
Electrical Connection:	screw terminals with a conductor cross section range of 14-26 AWG
Recommended Cable:	Anderson shielded molded cordset, alternatively: 22-24 AWG, foil shielded, 0.17 - 0.26" Cable Sheath OD for use with cord grip or field wiring connector
Electrical Protection:	Voltage spike and reverse polarity
Operating Voltage:	18-36 VDC (24 VDC Nominal regulated or unregulated)
Zero Adjustment:	one touch
Re-Span:	With switch through user interface & with or without a reference pressure source
Electronics Puck:	Modular, field replaceable
Fitting & Sensor Stem:	Modular, field replaceable

APPROVALS AND DOCUMENTATION

Sanitary:	ASME-BPE 2012 compliant
Compliance:	HART 7.0 Compatible Fieldbus Foundation Registered CE compliant* Designed and manufactured to sound engineering practices in accordance with Article 3.3 of the PED 97/23/EC CSA-B51-03 CRN# CSAOF9754.5R1
Warranty:	2 years

* Foundation Fieldbus product is not ROHS compliant

Figure 1 - Dimensional Drawings

3.6"
(91mm)

6.6" (167mm)
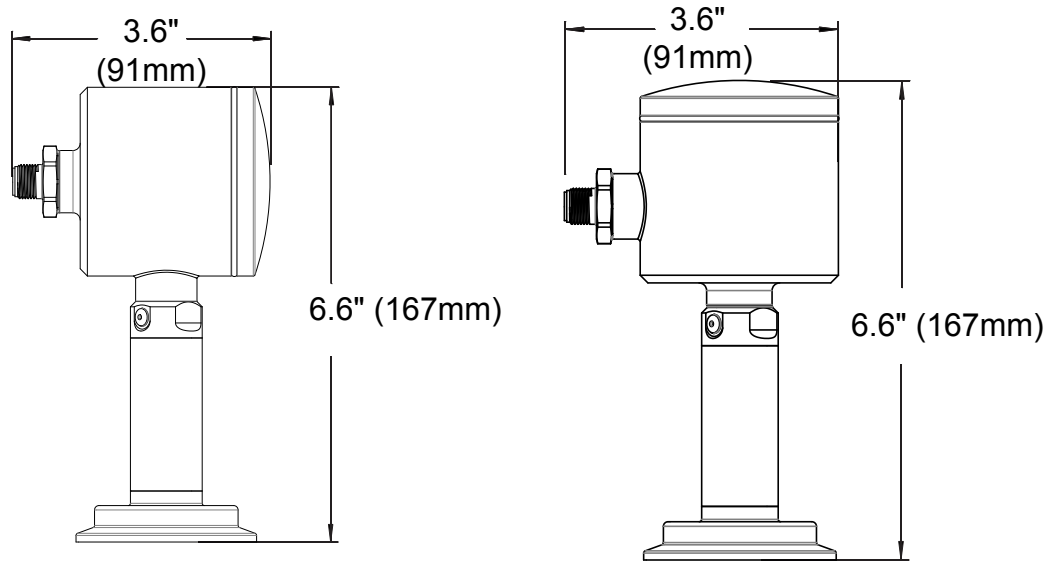
Horizontal Orientation

3.6"
(91mm)

6.6" (167mm)

Vertical Orientation

Cable lengths
available in
5', 10', 15', 20'
and 25'

7.87" (200mm)
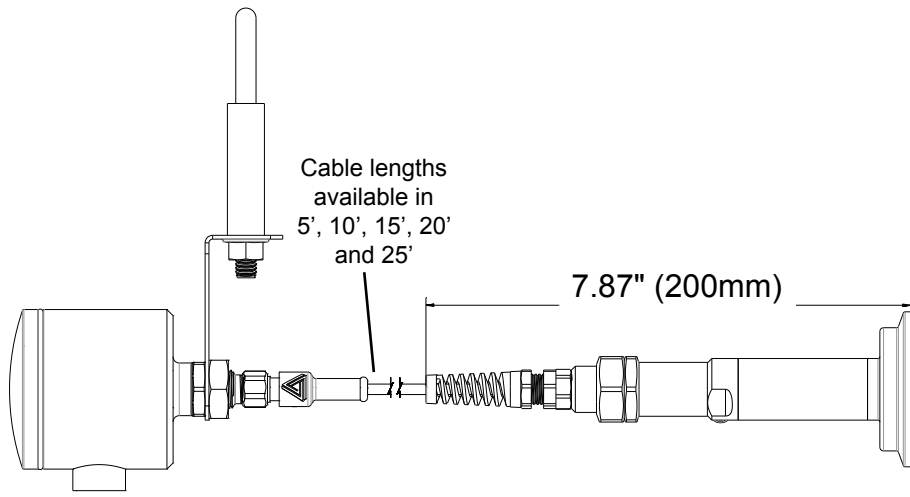
Remote Version

Section 2 - Theory of Operation and Description

The Anderson Modular Pressure Transmitter (MPP) may be utilized for applications in which a process variable of pressure must be converted to an electronic signal. This unit utilizes an internal pressure transducer to convert the process measurement into a corresponding mV signal. The mV signal then passes through custom linearization and conditioning circuitry. The resulting signal is an industry standard 4-20 mA or digital signal. This signal is factory set over the specified range of the unit. From here the signal may be sent to an Anderson digital display, microprocessor based controller, chart recorder, or customer supplied instrumentation. An integral diagnostic interface provides menu feedback, visually displays diagnostic error codes and nominally measures and displays either the loop current or process variable in PSI or BAR. In addition, the MPP is also supplied with a modular display interface for readout directly at the process location.

The MPP Transmitter has been specifically designed for use in Life Sciences applications where accurate and repeatable pressure measurement is required. The measurement cell is integral to a welded sanitary diaphragm seal that is available in a variety of industry standard fitting styles and sizes. The process pressure deflects the metal diaphragm, transmitting the pressure to a transducer cell. The output signal, which is proportional to the process pressure, is then measured and processed.

Section 3 - Installation

The physical installation is the most important concern with regards to promoting sensor reliability. Sensors must be installed in such a way that the housing and cable is not subject to physical abuse. In addition, moisture or moist air must not be allowed to enter the sensor housing or cable.

NOTE: The installer assumes responsibility for preventing water or water-vapor from entering the sensor housing by proper installation of the cap and appropriate cable preparation. Units equipped with M12 Quick Disconnects are rated to NEMA 4X and IP69X. Cable gland equipped units are rated to NEMA 4X and IP67.

To facilitate electrical connections, your new MPP transmitter may be supplied with a 5pin M12 quick disconnect receptacle, a M16 cable gland, or a ½" NPTF threaded adaptor. If mounted horizontally, the cable connection should point downward. Also, to prevent entry of excessive moisture, it is highly recommended that flexible conduits not be connected directly to the sensor. If conduit is to be run to the sensor, it is preferable that the watertight connector provided with each sensor not be removed from the sensor. Instead, run the flexible conduit as near to the sensor as possible and utilize a seal-tight connector at the end of the conduit. Allow a short amount of cable to run between the sensor and the flexible conduit. This isolates the sensor housing from the conduit system and any moisture it may contain. If the conduit is connected directly to the sensor, the chances are high that the sensor will eventually fail due to excessive water or water vapor entry into the housing.

NOTE: It is recommended that a sensor "ZERO" be performed at time of installation. Refer to section 8.1, page 17 for information on this procedure.

Section 4 - Sensor Wiring

For wet environments requiring IP67 or greater environmental protection Anderson strongly recommends using available Anderson shielded molded cord-sets utilizing 5 pin M12 eurofast design quick disconnect. Anderson supplied cable meets all requirements for shielding and compatibility with MPP quick disconnect receptacle.
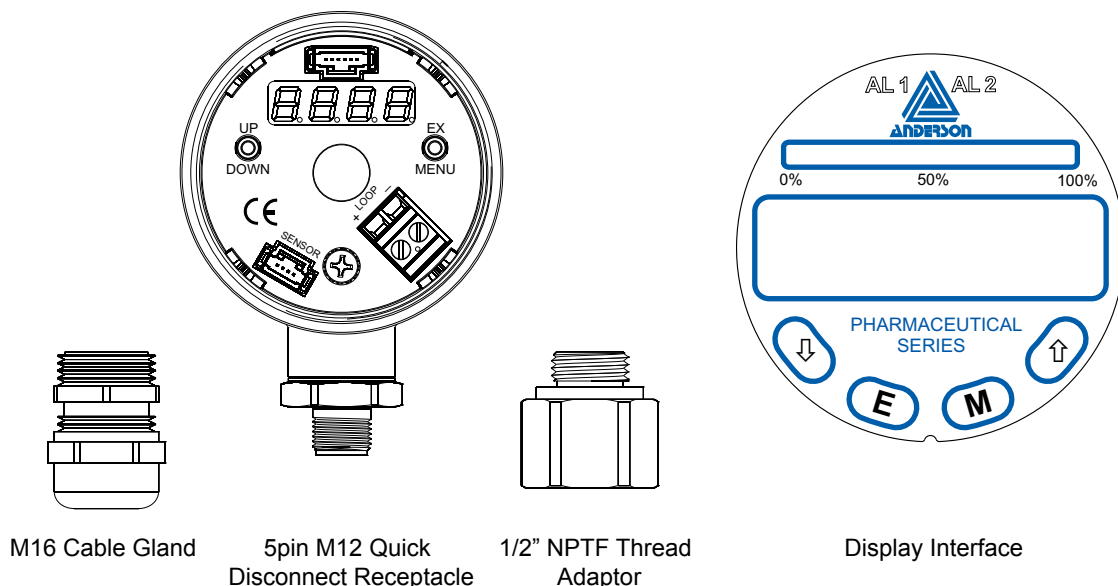
Anderson recommends a cable of 24 gauge, 4 conductor, shielded (Belden #9534) or equivalent. Four conductor cable is utilized because of its roundness, which provides a suitable seal when used with seal-tight connectors, strain reliefs and rubber grommets. Irregular shaped cable does not allow for a watertight seal. If utilizing customer supplied cable, select a round cable with 22-24 AWG wire and a shield. In order for the Anderson provided seal-tight connector to seal on the cable, the O.D. of the cable must be between 3/16" and 1/4". If smaller cable is utilized, a different neoprene bushing must be used (must be customer supplied).

If an alternate seal-tight type connector is going to be used, be absolutely certain that the rubber bushing will adequately seal on the cable. Do not use a connector intended for power cable (large inside diameter) if the sensor cable is only 1/4". Be sure to use Teflon thread tape when attaching the new seal-tight connector.

Wiring to the conduit housing sensors is accomplished as follows:

1. Remove the housing cap and lift out cover plate or display (optional) to expose the wiring terminal block. Exercise care when disconnecting ribbon connectors.

2. Insert the cable through the seal-tight connector, stripping back approximately 2 inches of sheathing to expose the wires.

3. Two wires will be utilized for connections at the transmitter end of the loop. Normal color codes being RED (Loop +) and BLACK (Loop -). Trim off all unused wires, including the bare shield ground wire. To prevent a GROUND LOOP condition, be sure the shield material and the shield ground wire do not touch the sensor housing. Use an insulator such as electrical tape or heat shrink tubing if necessary.

4. Strip the tips of the remaining wires back approximately 3/8 of an inch and twist strands (tinning is highly recommended).

5. Using Figure 2, make the proper connections to the wiring connector (located inside the housing)

Figure 2 - Wiring Terminal Connections

M16 Cable Gland   5pin M12 Quick   1/2" NPTF Thread   Display Interface
                     Disconnect Receptacle   Adaptor

Section 5 - Instrument Wiring

With the proper wiring connections made at the senor end of the loop, it is now time to make final connections at the instrument end of the loop. The MPP may feed instruments such as Anderson digital display, microprocessor based controllers, chart recorders, or customer supplied instrumentation.

5.1 LOOP POWER

The Anderson MPP requires loop power for operation. Ratings are as follows:

MPP Transmitter: 18-36 VDC (Absolute) for HART, 24 VDC Nominal, regulated or unregulated; 9-32 VDC for FFB

As inherent resistance associated with cable length and signal receiver input may affect operation of the transmitter, Figure 3 shows some guidelines for loop power required.

FIGURE 3 - Loop Power Guidelines
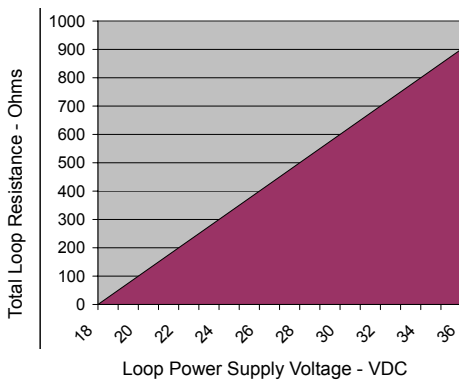
Please consult the Installation/Service Manual that was provided with your receiver for specific wiring instruction. Most Anderson receiver (displays, chart recorders, etc.) are capable of supplying loop power. Typical wiring would be as follows:

FIGURE 4 - Sensor Wiring
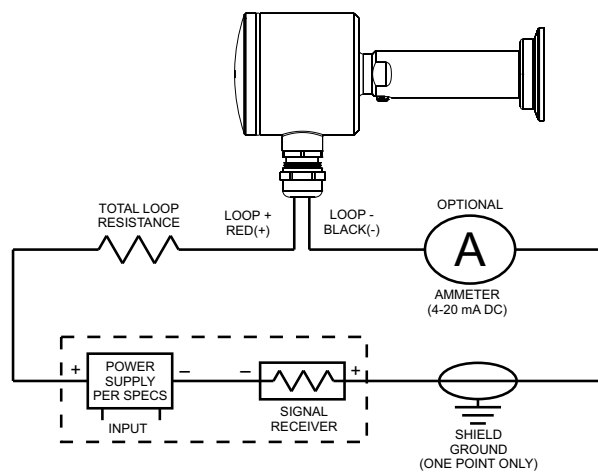
Section 6 - Modular Assembly

The MPP transmitter consists of two distinct sections, enclosure and stem that individually are comprised of one or more components. Field replacement of these components is possible to accommodate orientation reconfiguration and component replacement.

6.1 Electronic puck replacement

Puck replacement may be accomplished at the application site assuming sufficient clearance is available.

1. Remove wire cover plate or if equipped with display squeeze clip connector and remove display ribbon from socket on puck.
2. If equipped with M12 QDR (**q**uick **d**isconnect **r**eceptacle) remove conductors from wiring connector and unscrew receptacle from enclosure. Factory torque spec is 20ft-lbs.
3. Squeeze clip connector and remove sensor ribbon from socket on puck
4. Unscrew ground lug, slide puck out of enclosure
5. Reverse to install

6.2 Separation of measurement cell (stem) from enclosure

This proceed will require immobilizing the enclosure. If a vice is used steps should be taken to protect the surface of the enclosure

1. Squeeze clip connector and remove sensor ribbon from socket on puck
2. Unscrew stem from enclosure. Factory torque spec is 20ft-lbs.
3. Reverse to install

6.3 Reorientation of enclosure to stem

The threaded penetrations of the enclosure allow orientation in either a horizontal or vertical arrangement.

1. Complete steps 1 - 3 of 6.1 above
2. Unscrew stem from enclosure. Factory torque spec is 20ft-lbs
3. Reassemble stem to desired enclosure penetration. Factory torque spec is 20ft-lbs
4. Connect ribbon cable connector to puck receptacle located next to ground lug.
5. Reassemble M12 QDR (if equipped) to remaining penetration and install conductors. Factory torque spec is 20ft-lbs

FIGURE 5 - Exploded View
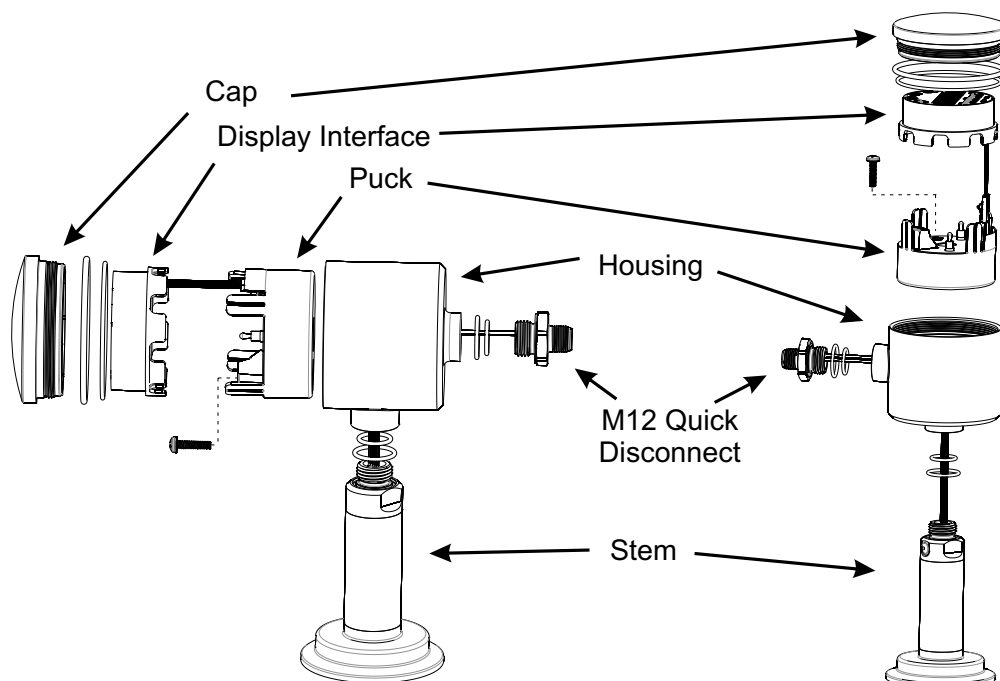
6.4 Remote Kit and MPPs equipped with remote configuration

The MPP series may be configured or retrofitted with remote cabling allowing the housing and display (if equipped) to be mounted up to 25 feet from the process connection. The remote cabling preserves the modular design and may be removed or added from the MPP at the user's discretion.

Adding the Remote kit. Refer to Figure 6.

Note: all threaded connections to be torqued to 20ft-lbs

1. Separate the measurement cell (stem) from enclosure
    a. Remove wire cover plate or if equipped with Display Interface squeeze clip connector and remove display ribbon
    b. Squeeze clip connector and remove sensor ribbon from socket on puck
    c. Unscrew stem from enclosure. Utilize care extracting ribbon cable.
2. Attach remote kit cabling to measurement cell stem
    a. Route stem ribbon cable through kit stem adaptor. Screw on adaptor
    b. Connect ribbon cable connector to cable kit receptacle and carefully fold excess ribbon cable into stem adaptor
    c. Insert cable kit fitting into stem adaptor. Secure by threading on union nut
3. Attach remote QDR adaptor to desired enclosure opening
    a. Carefully insert ribbon cable through enclosure opening
    b. Screw remote QDR adaptor into place
    c. Connect ribbon cable connector into sensor receptacle on puck
4. Attach pipe mount adaptor to remote QDR adaptor and secure with nut. Position as required.
5. Attach remote kit M12 plug to remote QDR adaptor

Reverse to un-install.

WARNING – To avoid possible ribbon cable damage, remove union nut and unplug ribbon from socket before removing stem adaptor from stem.

Figure 6 - Remote View
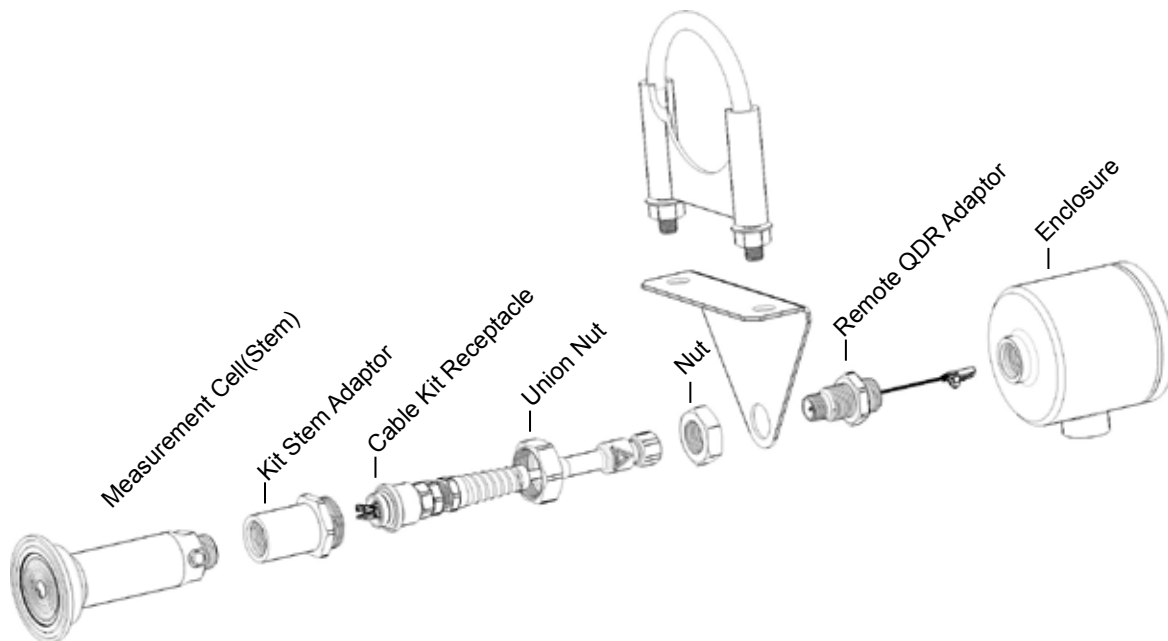
Section 7 - Configuration

7.1 - Configuration (without display) - Native Units, Output, Range, Dampening - HART version only

(See 7.2 for configuration with display interface)

The MPP's menu functions are accessed via the toggle switches on either side of the interface display
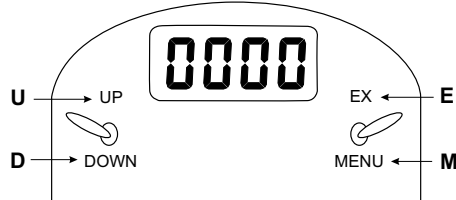
"**U**" up & "**D**" down are toggle pressed on the left switch, "**E**" execute & "**M**" menu are toggle pressed on the right switch

All instructions assume start from "RUN" mode which is default at power on and milliamp output displayed. If multiple configuration changes are desired it is not necessary to exit to "RUN" mode before configuring the next desired operation. Once desired operation configuration is accomplished pressing "M" repeatedly will scroll through operations. Run mode is achieved when milliamp output is displayed.

RUN Mode	**SENSOR CONFIG Mode**	**CALIBRATION Mode**
Zero	4-20mA/Process Variable	2 Point Cal
	PSIG / BAR	4 Point Cal
	4-20mA / 20-4mA	
	LRV	
	URV	
	Damping	
	Factory Restore	

7.1.1 Display Mode: 4-20mA or Process Variable

1. Press "M" - Sensor displays "COnF"
2. Press "U" & "E" simultaneously for 2 seconds - sensor displays "CvAL" or "PvAL"
3. Press "U" or "D" - Sensor display toggles between "CvAL" or "PvAL"
4. Press "M" to proceed to next operation or if no other operation is to be accessed exit to "RUN"

7.1.2 Native Units: PSI or Bar

1. Press "M" – Sensor displays "COnF"
2. Press "E" – Sensor displays "PSI" or "BAR"
3. Press "U" or "D" – Sensor toggles between "PSI" or "BAR"
4. Press "M" to proceed to the next operation

Note: When changing native units configuring range is now required

7.1.3 Output: 4mA – 20mA or 20mA – 4mA

1. Press "M" – Sensor displays "COnF"
2. Press "E" – Sensor displays "PSI" or "BAR"
3. Press "M" – Sensor displays "4-20" or "20-4"
4. Press "U" or "D" – Sensor toggles between "4-20" or "20-4"
5. If no other operation is to be accessed exit to "RUN" mode via pressing "M" repeatedly

7.1.4 Pressure Range

7.1.41 LRV: Lower range value

Sensors equipped with "Compound" style measurement cells (stem) may configure the LRV. "Absolute" stems are predefined as 0 and are not reconfigurable

1. Press "M" – Sensor displays "COnF"
2. Press "E" – Sensor displays "PSI" or "BAR"
3. Press "M" – Sensor displays "4-20" or "20-4"
4. Press "M" – Sensor displays "LRV"
5. Press "E" – Sensor displays present LRV value – Example: "0"
6. Press "U" or "D" to set desired LRV value– Sensor display increases or decreases accordingly

Note: continue to URV

7.1.42 URV: Upper range value

Note: starting from LRV above

7. Press "M" – Sensor displays "URV"
8. Press "E" – Sensor displays present URV value – Example: "50"
9. Press "U" or "D" to set desired URV value – Sensor display increases or decreases accordingly
10. Press "E" to store displayed value – Sensor displays "URV"
11. If no other operation is to be accessed exit to "RUN" mode via pressing "M" repeatedly

7.1.5 Output Damping

1. Press "M" – Sensor displays "COnF"
2. Press "E" – Sensor displays "PSI" or "BAR"
3. Press "M" – Sensor displays "4-20" or "20-4"
4. Press "M" – Sensor displays "LRV"
5. Press "M" – Sensor displays "URV"
6. Press "M" – Sensor displays "dMPg"
7. Press "E" – Sensor displays current damping value from 0 - 10
8. Press "U" or "D" to display desired damping value– Sensor display increases or decreases accordingly
9. Press "E" to store displayed value – Sensor displays "dMPg"
10. If no other operation is to be accessed exit to "RUN" mode via pressing "M" repeatedly until milliamp output is displayed

7.1.6 Factory configuration reset

Perform if a return to the original factory configuration is desired

1. Press "M" – Sensor displays "COnF"
2. Press "E" – Sensor displays "PSI" or "BAR"
3. Press "M" – Sensor displays "4-20" or "20-4"
4. Press "M" – Sensor displays "LRV"
5. Press "M" – Sensor displays "URV"
6. Press "M" – Sensor displays "dMPg"
7. Press "M" – Sensor display "FrES"
8. Press "E" – Sensor display "nO"
9. Press "U" or "D" to display "YES"
10. Press "E" – Sensor display "FrES"
11. Exit to "RUN" mode via pressing "M" repeatedly until milliamp output is displayed

7.2 - Configuration (with display interface) - Native Units, Output, Range, Damping, Alarms, Display Units - HART and FFB Units

The MPP's menu functions are accessed via the arrow buttons on either side of the interface display

Down → Execute → E   M → Menu ← Up
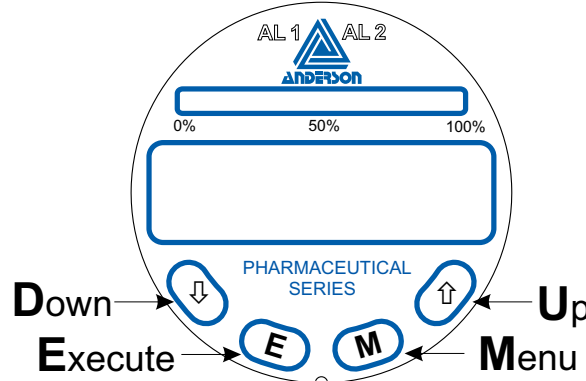
"**U**" up & "**D**"are button presses on the right and left of the display. "**E**" execute and "**M**" menu are button presses located between the up and down arrows.

All instructions assume start from "RUN" mode which is default at power on and process value displayed. If multiple configuration changes are desired it is not necessary to exit to "RUN" mode before configuring the next desired operation. Once desired operation configuration is accomplished pressing "M" repeatedly will scroll through operations. Run mode is achieved when process value is displayed.

RUN Mode	SENSOR CONFIG Mode	CALIBRATION Mode
Zero	PSIG/BAR (native units)	2 Point Cal
Adjust Display Decimal	4-20mA / 20-4mA(HART only)	4 Point Cal
Momentarily Display mA Output(HART only)	LRV	
Descriptive Error Message	URV	
	Damping	
	Alarm1	
	Alarm2	
	Display Units	
	Unit Description Scroll	
	Factory Restore	

7.2.1 Run Mode:

Zero - see section 8.1

Display Decimal - the number of decimal places displayed may be adjusted by pressing ⇧ or ⇩

Momentary mA display - the measured process value may be monetarily displayed by pressing "E"

Descriptive Error Message - press ⇧ for a descriptive error message.

7.2.2 Native Units: PSI or Bar

1. Press "M" – Sensor displays "CONF"
2. Press "E" – Sensor displays "PSIG" or "BARG"
3. Press "U" or "D" – Sensor toggles between "PSIG" or "BARG"
4. Press "M" once to proceed to the next operation or repeatedly to return to Run Mode

Note: When changing native units configuring range is now required

7.2.3 Output: 4mA – 20mA or 20mA – 4mA - HART only

1. Press "M" – Sensor displays "CONF"
2. Press "E" – Sensor displays "PSIG" or "BARG"
3. Press "M" – Sensor displays "4-20" or "20-4"
4. Press "U" or "D" – Sensor toggles between "4-20" or "20-4"
5. If no other operation is to be accessed exit to "RUN" mode via pressing "M" repeatedly

7.2.4 Pressure Range

7.2.41 LRV: Lower range value
Sensors equipped with "Compound" style measurement cells (stem) may configure the LRV. "Absolute" stems are predefined as 0 and are not reconfigurable

1. Press "M" – Sensor displays "CONF"
2. Press "E" – Sensor displays "PSIG" or "BARG"
3. Press "M" – Sensor displays "4-20" or "20-4" (HART only)
4. Press "M" – Sensor displays "LRV"
5. Press "E" – Sensor displays present LRV value – Example: "0"
6. Press "U" or "D" to set desired LRV value– Sensor display increases or decreases accordingly

Note: continue to URV

7.2.42 URV: Upper range value
Note: starting from LRV above
7. Press "M" – Sensor displays "URV"
8. Press "E" – Sensor displays present URV value – Example: "50"
9. Press "U" or "D" to set desired URV value – Sensor display increases or decreases accordingly
10. Press "E" to store displayed value – Sensor displays "URV"
11. If no other operation is to be accessed exit to "RUN" mode via pressing "M" repeatedly

7.2.5 Output Damping
1. Press "M" – Sensor displays "CONF"
2. Press "E" – Sensor displays "PSIG" or "BARG"
3. Press "M" – Sensor displays "4-20" or "20-4" (HART only)
4. Press "M" – Sensor displays "LRV"
5. Press "M" – Sensor displays "URV"
6. Press "M" – Sensor displays "DAMP"
7. Press "E" – Sensor displays current damping value from 0 - 10
8. Press "U" or "D" to display desired damping value– Sensor display increases or decreases accordingly
9. Press "E" to store displayed value – Sensor displays "DAMP"
10. If no other operation is to be accessed exit to "RUN" mode via pressing "M" repeatedly until process value is displayed

7.2.6 Setting Alarms – Alarms are visual indication only if MPP is not optioned with relays
1. Press "M" – Sensor displays "CONF"
2. Press "E" – Sensor displays "PSIG" or "BARG"
3. Press "M" – Sensor displays "4-20" or "20-4" (HART only)
4. Press "M" – Sensor displays "LRV"
5. Press "M" – Sensor displays "URV"
6. Press "M" – Sensor displays "DAMP"
7. Press "M" – Sensor displays "ALRM1"
8. Press "E" – Sensor displays "OFF" or "ON"
9. Press "U" or "D" – Sensor toggles between "ON" or "OFF" set to "ON"
10. Press "E" – Sensor displays "High" or "LOW"
11. Press "U" or "D" – Sensor toggles between "HIGH" or "LOW" Choose either active high or active low
12. Press "E" – Sensor displays "SETPT"
13. Press "E" – Sensor displays set point pressure.
14. Press "U" or "D" repeatedly to select alarm1 pressure
15. Press "E" – Sensor displays "HYST" (allows hysteresis or dead band)
16. Press "E" – Sensor displays "0" or "1" (turns on dead band preset at 1% of set point)
17. Press "U" or "D" – Sensor toggles between "0" or "1"
18. Press "E" – Sensor displays "ALRM1"
19. Press "M" – Sensor displays "ALRM2"
20. Repeat from instruction 8 to set alarm 2 if desired otherwise press "M" to proceed to next operation or repeatedly to exit to "run" mode

7.2.7 Setting display process variable

The following Engineering units may be selected:
Millibar, Torr & Kg/cm2, PSI, BAR, kPA, In H2O, In Hg, mm H2O, mA

1. Press "M" – Sensor displays "CONF"
2. Press "E" – Sensor displays "PSIG" or "BARG"
3. Press "M" – Sensor displays "4-20" or "20-4" (HART only)
4. Press "M" – Sensor displays "LRV"
5. Press "M" – Sensor displays "URV"
6. Press "M" – Sensor displays "DAMP"
7. Press "M" – Sensor displays "ALRM1"
8. Press "M" – Sensor displays "ALRM2"
9. Press "M" – Sensor displays currently set engineering unit
10. Press "U" or "D" repeatedly to select the desired engineering unit
11. Press "M" to proceed to next operation or repeatedly to exit to "run" mode

7.2.8 Setting display process variable marquee time.

The display may be set to repeatedly scroll the Engineering unit selected in a marquee style

Note: There is no marquee function if milliamp is selected.

1. Press "M" – Sensor displays "CONF"
2. Press "E" – Sensor displays "PSIG" or "BARG"
3. Press "M" – Sensor displays "4-20" or "20-4" (HART only)
4. Press "M" – Sensor displays "LRV"
5. Press "M" – Sensor displays "URV"
6. Press "M" – Sensor displays "DAMP"
7. Press "M" – Sensor displays "ALRM1"
8. Press "M" – Sensor displays "ALRM2"
9. Press "M" – Sensor displays "UDISP"
10. Press "E" – Sensor displays "OFF" or the current marquee scroll interval
11. Press "U" or "D" repeatedly to select the desired scroll interval
12. Press "E" – to store, sensor displays "UDISP"
13. Press "M" to proceed to next operation or If no other operation is to be accessed exit to "RUN" mode via pressing "M" repeatedly until process variable is displayed

7.2.9 Factory configuration reset

Perform if a return to the original factory configuration is desired

1. Press "M" – Sensor displays "CONF"
2. Press "E" – Sensor displays "PSIG" or "BARG"
3. Press "M" – Sensor displays "4-20" or "20-4" (HART only)
4. Press "M" – Sensor displays "LRV"
5. Press "M" – Sensor displays "URV"
6. Press "M" – Sensor displays "DAMP"
7. Press "M" – Sensor display "FAC"
8. Press "E" – Sensor display "nO"
9. Press "U" or "D" to display "YES"
10. Press "E" – Sensor display "FAC"
11. Exit to "RUN" mode via pressing "M" repeatedly until process value is displayed

Section 8 - Calibration

The MPP is calibrated at the factory to meet the specified accuracy for any allowable range that may be configured. As general maintenance to the unit, a zero check is recommended at approximately 12 month intervals. Over time errors may be accumulated due to the impact of environment and operation. If you feel that the output of the MPP transmitter is not correct, calibration of the unit may be required. Accumulated offset errors have the greatest impact to accuracy over time. These may easily be addressed in the "field" via the "one touch Zero" function in section 8.1. Further calibration to address possible errors in the range may be addressed in the field but will require analytical caliber equipment to provide accurate pressure standards. The MPP may also be returned to Anderson for a full factory recalibration. 8.2 illustrates the procedures for custom range calibration of the transmitter.

8.1 CALIBRATION – Zero

NOTE – For ABSOLUTE stems zero calibration is disabled as zeroing is not possible in atmospheric conditions.

All instructions assume starting from "RUN" mode which is default at power on and process value displayed. Zeroing the sensor provides the best accuracy when clamped into the application therefore negates possible positioning and clamping errors. Be sure sensor is exposed to zero psig when performing this function.

Units Without Display:
1. Press both "D" and "M" simultaneously for approximately 5 seconds – Sensor displays 4.00 milliamp for gauge, for compound sensor displays appropriate output for set range.

Units with Display Interface:
1. Press both ⇩ and "M" simultaneously for approximately 5 seconds.

8.2 CALIBRATION - Range

Field calibration of the MPP results in a "custom calibration" range. This may be desired as it provides (in 4 point calibration mode) the best possible accuracy for a given specific range. Once this procedure is completed care should be taken not to perform any subsequent "configuration" range changes as this will result in returning to the original factory calibration data.

When performing this calibration the range desired must be first set in the "configuration" mode. Refer to 7.1.4 for integral display or 7.2.4 for display interface to set this range.

Equipment required: Pressure suitable standard that can achieve URV, Accurate reference gauge, DC Milliamp Meter (accurate to +/- .005 mA)

The MPP accommodates both 2 point and 4 point calibrations. 4 point calibrations yield the most accurate results and are therefore preferred.

If your unit is calibrated at a "COMPOUND" range, you will not see 4.00 mA at atmospheric zero. As reference, you may use the following chart to determine if your unit may require calibration (most common ranges are shown).

Sensor Range	Sensor Reads at Atmospheric Zero
0-psig - Positive Pressure	4.00 mA
0-psig - 30" Hg	4.00 mA
30" Hg - 15 psig	11.92 mA
30" Hg - 30 psig	9.26 mA
30" Hg - 60 psig	7.15 mA
30" Hg - 100 psig	6.05 mA

The output of a properly calibrated transmitter may be calculated by using the following formula:

$$\text{mA Output} = \left[16 \times \left[\frac{\text{(KNOWN VALUE - LOW END OF RANGE}}{\text{TRANSMITTER SPAN}} \right] \right] + 4$$

NOTE: For pressure transmitters with compound ranges, the ranges must first be converted to all one type unit of measure. For example, a 30" Hg/0/35 psig unit maybe considered to have a range of -14.7 psig-0-35 psig and a span of 49.7 psig (2.036" Hg = 1 psi). Be careful not to lose the (-) sign while performing the calculation of the proper reading.

If your unit is calibrated at a "ABSOLUTE" range, you will not see 4.00 mA at atmospheric zero. Calibration requires an analytical quality pressure source and reference gauge

NOTE: The transmitter should be wired in a complete loop at this point, or on a test bench and configured per the diagram shown in Figure 4, page 8.

8.21 Custom calibration range – COMPOUND STEM, 4 point
NOTE: For pressure transmitters with compound ranges, the ranges must first be converted to all one type unit of measure. For example, a 30" Hg - 0-30 psig unit may be considered to have a range of -14.7 psig - 0-30 psig and a span of 44.7 psig (2.036" Hg = 1 psi). Be careful not to lose the (-) sign while performing the calculation of the proper reading.

1. Clamp sensor into calibration fitting and expose the transmitter to a known zero reference point.
2. Set meter to DC mA and connect meter in series with loop + .
3. Press "M" – Sensor displays "COnF"
4. Press "M" – Sensor displays "CAL"
5. Press "E" – Sensor displays "CCAL"
6. Press "E" – Sensor displays "2PtS"
7. Press "U" or "D" to set 4 point calibration – Sensor displays "4PtS"
8. Press "E" holding for approximately 2 seconds – Sensor displays "ArEF" ("ATM" with Display Interface)
9. Expose sensor to atmospheric pressure
10. Press "E" – Sensor will store the atmospheric reference and displays "LrV"
11. Press "E" – Sensor display will prompt the desired pressure standard. Press ⇩ or ⇧ to adjust.
12. Expose sensor to requested pressure
13. Press "E" – Sensor displays "Pt2"
14. Press "E" – Sensor display will prompt the desired pressure standard. Press ⇩ or ⇧ to adjust.
15. Expose sensor to requested pressure
16. Press "E" – Sensor displays "Pt3"
17. Press "E" – Sensor display will prompt the desired pressure standard. Press ⇩ or ⇧ to adjust.
18. Expose sensor to requested pressure
19. Press "E" – Sensor displays "UrV"
20. Press "E" – Sensor display will prompt the desired pressure standard.
21. Expose sensor to requested pressure
22. Press "E" – Sensor displays "CCAL"
23. Exit to "RUN" mode via pressing "M" repeatedly until process value is displayed

8.22 Custom calibration range –COMPOUND STEM, 2 point

1. Clamp sensor into calibration fitting and expose the transmitter to a known zero reference point.
2. Set meter to DC mA and connect meter in series with loop + .
3. Press "M" – Sensor displays "COnF"
4. Press "M" – Sensor displays "CAL"
5. Press "E" – Sensor displays "CCAL"
6. Press "E" – Sensor displays "2PtS"
7. Press "U" or "D" to set 2 point calibration sensor displays "2PtS"
8. Press "E" holding for approximately 2 seconds – Sensor displays "ArEF"("ATM" with Display Interface)
9. Expose sensor to atmospheric pressure
10. Press "E" – Sensor will store the atmospheric reference and displays "LrV"
11. Press "E" – Sensor display will prompt the desired pressure standard. Press ⇩or⇧ to adjust.
12. Expose sensor to requested pressure
13. Press "E" – Sensor displays "UrV"
14. Press "E" – Sensor display will prompt the desired pressure standard.
15. Expose sensor to requested pressure
16. Press "E" – Sensor displays "CCAL"
17. Exit to "RUN" mode via pressing "M" repeatedly until process value is displayed

8.23 Custom calibration range – ABSOLUTE STEM, 4 point

1. Clamp sensor into calibration fitting and expose the transmitter to a known zero reference point.
2. Set meter to DC mA and connect meter in series with loop + .
3. Press "M" – Sensor displays "COnF"
4. Press "M" – Sensor displays "CAL"
5. Press "E" – Sensor displays "CCAL"
6. Press "E" – Sensor displays "2PtS"
7. Press "U" or "D" to set 4 point calibration – Sensor displays "4PtS"
8. Press "E" – holding for approximately 2 seconds – Sensor displays "LrV"
9. Press "E" – Sensor displays "VAC". Press ⇩or⇧ to adjust.
10. Expose sensor to requested pressure
11. Press "E" – Sensor displays "Pt2"
12. Press "E" – Sensor display will prompt the desired pressure standard. Press ⇩or⇧ to adjust.
13. Expose sensor to requested pressure
14. Press "E" – Sensor displays "Pt3"
15. Press "E" – Sensor display will prompt the desired pressure standard. Press ⇩or⇧ to adjust.
16. Expose sensor to requested pressure
17. Press "E" – Sensor displays "UrV"
18. Press "E" – Sensor display will prompt the desired pressure standard.
19. Expose sensor to requested pressure
20. Press "E" – Sensor displays "CCAL"
Exit to "RUN" mode via pressing "M" repeatedly until milliamp output is displayed

8.24 Custom calibration range –ABSOLUTE STEM, 2 point

1. Clamp sensor into calibration fitting and expose the transmitter to a known zero reference point.
2. Set meter to DC mA and connect meter in series with loop + .
3. Press "M" – Sensor displays "COnF"
4. Press "M" – Sensor displays "CAL"
5. Press "E" – Sensor displays "CCAL"
6. Press "E" – Sensor displays "2PtS"
7. Press "U" or "D" to set 2 point calibration sensor displays "2PtS"
8. Press "E" holding for approximately 2 seconds – Sensor displays "LrV"
9. Press "E" – Sensor displays "VAC". Press ⇩or⇧ to adjust.
10. Expose sensor to requested pressure
11. Press "E" – Sensor displays "UrV"
12. Press "E" – Sensor display will prompt the desired pressure standard.
13. Expose sensor to requested pressure
14. Press "E" – Sensor displays "CCAL"
Exit to "RUN" mode via pressing "M" repeatedly until milliamp output is displayed

8.3 Calibration –Milliamp Meter - HART Only
The MPP contains circuitry to measure the loop current. This meter may be calibrates to match a users external reference.

1. Press "M" – Sensor displays "COnF"
2. Press "M" – Sensor displays "CAL"
3. Press "E" – Sensor displays "CCAL"
4. Press "M" – Sensor displays "MCAL" (HART only)
5. Press "E" – Sensor displays "04 mA"
6. Press "U" or "D" to match external reference to 4 mA.
7. Press "E" – Sensor displays "20 mA"
8. Press "U" or "D" to match external reference to 20 mA.
9. Press "E" – to store values - sensor displays "MCAL" (HART only)
Exit to "RUN" mode via pressing "M" repeatedly until process value is displayed

Section 9 - Maintenance/Diagnostics

Anderson electronic sensors require very little maintenance, if any. We suggest that the sensor be inspected at 6 month intervals to ensure that they are not being subjected to physically abuse, moisture entering the housing, and that the wiring is sound.

The MPP is equipped with diagnostic routines that monitor the sensor's function. Should an error occur the diagnostic display will flash an error code and the output will be limited to 3.8 mA or less. Errors may be caused by a number of reasons ranging from failed electronic components to user configuration errors. The code appendix below indicates possible codes with actions that should be taken to correct the problem. Error codes may be cleared to facilitate subsequent menu changes, however the output will remain at 3.8 mA or less until error is addressed and the unit repowered. Always record the error code before attempting to clear it.

The display code may be erased as follows:

1. From "RUN" Mode Press "D" or ⇩ and hold for several seconds. Some error codes will not erase until problem is resolved – Sensor displays current process value.
2. Power cycle by removing power for 10 seconds then reattach power.
3. For units equipped with optional display interface press ⇧ for a descriptive error message.

Error Code	Category	Customer Action
No visible code, 3.8 mA output	Communication	Check Stem ribbon cable connection to puck, power cycle
e700	Internal System Failure	Reset Error and power cycle and if error is persistent replace puck
e701	Internal System Failure	Reset Error and power cycle and if error is persistent replace puck
e702	Internal System Failure	Reset Error and power cycle and if error is persistent replace puck
e500	Communication	Check Stem ribbon cable connection to puck, power cycle
e501	Stem Data Corruption	Replace Stem
e502	Stem Data Corruption	Replace Stem
e503	Stem Data Corruption	Replace Stem
e504	Stem Data Corruption	Replace Stem
e505	Insufficient loop voltage	Check if loop voltage is at least 18V, provide correct voltage then power cycle
e300	Stem Data Corruption	Replace Stem
e301	Stem Data Corruption	Replace Stem
e302	Stem Data Corruption	Replace Stem
e304	Stem Data Corruption	Replace Stem
e405	Puck Data Corruption	Replace Puck
e406	Puck Data Corruption	Replace Puck
e407	Puck Data Corruption	Replace Puck
e600	Puck Data Corruption	Replace Puck
e602	Stem Configuration Error	Reset Error and power cycle and if error is persistent replace Stem
e603	Stem Configuration Error	Reset Error and power cycle and if error is persistent replace Stem
e100	Incompatible Range	1) Reconfigure puck to a range compatible with the stem 2) power cycle 3) Reset Error
e101	Incompatible Range/ range changed	1) Reconfigure puck to a range compatible with the stem 2) power cycle 3) Reset Error
e200	Installation Fault	Power Cycle
e201	Communication	Power Cycle
e202	Communication	Power Cycle
e203	Communication	Power Cycle
e204	Data Corruption	Factory restore
OVER	Warning	Check Process - URV exceeded, cycle power to reset

Feel free to contact Anderson Technical Services Department at 1-800-833-0081 for further assistance with troubleshooting.

Section 10 - HART Communicator Connection & DD (Device Descriptor) Menu Structure

All MPP transmitters are equipped with HART output protocol and may be addressed via an external HART modem or alternatively via a portable HART communicator (HHT) compatible with HART 7.0.

10.1 Attaching HART Communicator

1. Power the MPP Transmitter. The signal loop must have at least 250ohms resistance for HHT function
2. Connect the HHT across the transmitter terminals or the resister loop
3. Turn on the HHT, wait until communications are established and the Home Menu is displayed

10.2 HART DD Menu Structure

All MPP functions as well as standard HART setup detail may be addressed via the HART DD menu. See following Menu DD for specific required paths.

Home Screen (Level 1)	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
Loop Current						
PV Value						
URV						
LRV						
Sensor Type						
Device Setup	Configuration	Loop Direction	4mA to 20mA			
			20mA to 4mA			
		LRV	LRV			
			Change Range			
		URV	URV			
			Change Range			
		Damping	Damping Value			
			Change Damping			
		Display Units	inH_2O			
			inHg			
			mmH_2O			
			mmHg			
			PSI			
			BAR			
			mBAR			
			kPa			
			Kg/cm^2			
			TORR			
		Native Units	PSI			
			BAR			
		Alarm 1 (or) Alarm 2	Energized			
			Active High			
			Out Of SPAN			
			Enabled			
			Set Point			
			Hysteresis			
			Turn On/Off			
			Change Type			
			Change SP			
			Change Hysteresis			
		Factory Restore	Yes / No			
	Calibration	Meter Calibration	Set 4mA			
			Set 20mA			
		Sensor Calibration	Two Point Calibration	Sensor Type PV URV		
			Four Point Calibration	PV LRV Calibration		

Home Screen (Level 1)	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
Device Setup	HART Setup	HART Configuration	Burst Configuration	Burst Message 1 Burst Message 2 Burst Message 3	Burst Mode	On / Off
					Burst Option	Choose Command
						Update Period
						Maximum Update Period
						Trigger Condition
						Device Variable Classification
						Burst units
						Trigger Level
			Number of Response Preambles			
			Loop Current Mode	Enable / Disable		
			Polling Address			
		HART Information	Model			
			Manufacturer			
			Device ID			
			HART Universal Revision			
			Descriptor			
			Message			
			Date			
			Tag			
			Long Tag			
			Final Assembly Number			
		HART Output	PV Pressure Value			
	Review	HART Review	Manufacturer ID			
			Universal Rev			
			Field Device Rev			
			Software rev			
			Hardware Rev			
			Tag			
			Descriptor			
			Message			
			Configuration Change Counter			
		Device Information	PV Native Units			
			PV Display Units			
			PV LRV			
			PV URV			
			PV Pressure USL			
			PV Pressure LSL			
			PV Damping			
			Firmware Rev			
			Serial Number			

Home Screen (Level 1)	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
Device Setup	Extended Setup	Clone Instrument Info	HART Variables	Descriptor		
				Message		
				Date		
				Tag		
				Long Tag		
				Final Assembly Number		
				Number of Request Preamble		
				Number of Response Preamble		
			Instrument Parameter	Display Units		
Diagnostics	Loop Test	Choose 4 mA				
		Choose 20 mA				
		Choose other mA value				
	Error Information	Error code with Description				
		Reset Error Codes				
	One Touch Zero	PV Value				
		Loop Value				
		Zero Trim				

Section 11 - Foundation Fieldbus Communication

11.1 Simulation Mode

In order to enable simulation mode move the jumper to the two pins closest to the "on" label as shown in the diagram below.
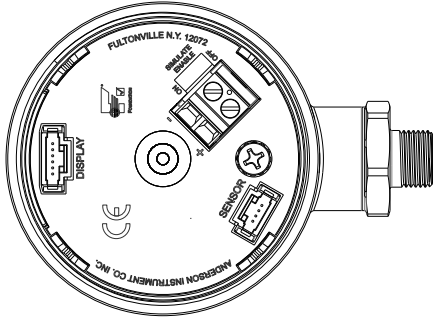
11.2 Foundation Fieldbus DD Menu Structure

The DD file can be downloaded from the fieldbus foundation at http://www.fieldbus.org/dddownload.php?key=65450

Home Screen (Level 1)	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
PV Value						
URV						
LRV						
Sensor Type						
		LRV	LRV			
			Change Range			
		URV	URV			
			Change Range			
		Damping	Damping Value			
			Change Damping			
		Display Units	inH2O			
			inHg			
			mmH2O			
			mmHg			
			PSI			
			BAR			
			mBar			
			kPa			
			KG/cm2			
			TORR			
		Calibration units	PSI			
			Bar			
		Alarm 1 (or) Alarm 2	Energized			
			Active High			
			Out Of SPAN			
			Enabled			
			Set Point			
			Hysteresis			
			Turn On/Off			
			Change Type			
			Change SP			
			Change Hysteresis			
		Factory Restore	Yes / No			
		Sensor Calibration	Four Point Calibration	Sensor Type PV URV PV LRV Calibration		

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Home Screen (Level 1)	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
		FFB Information	Model			
			Manufacturer			
			Device ID			
			HART Universal Revision			
			Descriptor			
			Message			
			Date			
			Tag			
			Long Tag			
			Final Assembly Number			
		FFB Output	PV Pressure			
	Review	FFB Review	Manufacturer ID			
			Universal Rev			
			Field Device Rev			
			Software rev			
			Hardware Rev			
			Tag			
			Descriptor			
			Message			
			Configuration Change Counter			
		Device Information				
			PV Display Units			
			PV LRV			
			PV URV			
			PV USL			
			PV LSL			
			PV Damping			
			Firmware Rev			
			Probe Type			
			No of Wires			
			Temperature Std			
			Serial Number			
	Error Information	Error code with Description				
		Reset Error Codes				

Section 12 - Warranty and Return Statement

These products are sold by The Anderson Instrument Company (Anderson) under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to a purchase of these products, as new merchandise, directly from Anderson or from an Anderson distributor, representative or reseller, and are extended only to the first buyer thereof who purchases them other than for the purpose of resale.

Warranty

These products are warranted to be free from functional defects in materials and workmanship at the time the products leave the Anderson factory and to conform at that time to the specifications set forth in the relevant Anderson instruction manual or manuals, sheet or sheets, for such products for a period of two years.

THERE ARE NO EXPRESSED OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREIN AND ABOVE SET FORTH. ANDERSON MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCTS.

Limitations

Anderson shall not be liable for any incidental damages, consequential damages, special damages, or any other damages, costs or expenses excepting only the cost or expense of repair or replacement as described above.

Products must be installed and maintained in accordance with Anderson instructions. Users are responsible for the suitability of the products to their application. There is no warranty against damage resulting from corrosion, misapplication, improper specifications or other operating condition beyond our control. Claims against carriers for damage in transit must be filed by the buyer.

This warranty is void if the purchaser uses non-factory approved replacement parts and supplies or if the purchaser attempts to repair the product themselves or through a third party without Anderson authorization.
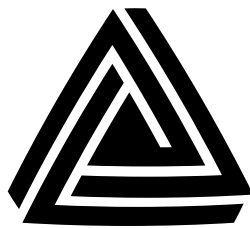
Returns

Anderson's sole and exclusive obligation and buyer's sole and exclusive remedy under the above warranty is limited to repairing or replacing (at Anderson's option), free of charge, the products which are reported in writing to Anderson at its main office indicated below.

Anderson is to be advised of return requests during normal business hours and such returns are to include a statement of the observed deficiency. The buyer shall pre-pay shipping charges for products returned and Anderson or its representative shall pay for the return of the products to the buyer.

Approved returns should be sent to: ANDERSON INSTRUMENT COMPANY INC.
155 AURIESVILLE ROAD
FULTONVILLE, NY 12072 USA

ATT: REPAIR DEPARTMENT

ANDERSON-NEGELE